

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

LEVER SYSTEM COVER AND

METHOD OF USE

EVO67177185US)

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Reference to Related Application

This application is based on provisional patent application serial number 60/436,435, filed December 24, 2002.

Background of the Invention

The field of the invention pertains to pressure vessels, and in particular to a cover that fits to and closes the pressure vessel or housing.

A cover for a pressure vessel must cover or close the interior of the vessel to retain the material within. The cover must be able to withstand the force within the vessel and not fail to retain its contents.

A problem is that locking the cover to the vessel has been accomplished by the use of multiple clamps, each individual clamp possibly tightened to a different torque. This can cause different or unequal force to be applied around the perimeter of the cover. Unequal forces could allow uneven stress at the cover seal, possibly contributing to its failure.

A need existed for a new cover that allows for it to be locked with equal force around the perimeter of the cover to the vessel, with assurance that if any clamping units are applied none can be inadvertently omitted.

Summary of the Invention

The invention is a lever system cover for a vessel to balance and equalize force applied around the perimeter of the cover. The invention locks the cover onto the vessel.

The invention comprises a cover for use with a vessel. The cover can be dish shaped having a convex underside that fits into the mouth of the vessel. The cover is attached to a handle that can be pivotably attached to the vessel. The cover may be counterbalanced for ease of operation.

A lever locating plate is mounted to the cover. The lever locating plate can have a ring shape. Lever locating plate has handles thereon for rotational deployment of the lever locating plate. Locking lever bars attached to the lever locating plate are moved by rotating the lever locating plate. The locking lever bars engage with hooks on the vessel. Locking members (levers, hook, etc.) are comprised from steel.

After the locking lever bars are positioned against the hooks. A clamp nut on the top of the cover is tightened and force is applied through the levers in order to hold the

cover against the top of the vessel. Forces are balanced and exerted around the perimeter of the cover by the bars.

The following steps are for using the lever system cover.

For clamping the cover, first the cover assembly is lowered or positioned onto the vessel, placing the cover onto the vessel opening. Then the lever locating plate is rotated thus moving the locking lever bar ends into engagement with the hooks/receiving members. Thereafter, the safety handle is moved into its locking position preventing lever locating plate movement and closing the safety valve allowing subsequent pressurization of the vessel and cover. Then the clamp mechanism is operated by screwing the clamp nut down, putting force on the levers to seal the cover against the vessel.

For unclamping the cover, the locking mechanism is unscrewed by reversing the clamp nut thus releasing forces and retracting the levers. The safety handle is positioned away from the lock position to the unlock position. By moving the safety handle to the unlock position the safety valve is opened preventing any system pressurization. The lever locating plate is rotated thus removing the lever bar ends from the receiving members. The cover assembly is raised or swung away from the vessel.

Brief Description of the Drawings

FIG. 1 illustrates a perspective view of the new lever system cover with the cover open;

FIG. 2 illustrates a perspective view of the new lever system cover with the cover placed onto the vessel and the levers in open positions;

FIG. 3 illustrates a perspective view of the new lever system cover with the cover in a closed and locked position with the safety handle operated to close the safety valve;

FIG. 4 illustrates a top view of the cover in a closed but unlocked position;

FIG. 5 illustrates a front partial sectional view of the cover in a closed position with the cover shown in phantom lines in the open position;

FIG. 6 illustrates a side view of the cover in a closed unlocked position with the safety lever in the open-valve position;

FIG. 7 illustrates a top view of the cover in a closed locked position;

FIG. 8 illustrates a front partial sectional view of the cover in a closed locked position with the lever bars in the clamping condition;

FIG. 9 illustrates a side view of the cover in a closed locked position with a break-out of the safety lever with valve closed;

FIG. 10 illustrates a sectional view of a part of the cover in a closed unlocked position with the lever bars in the released condition with the spring in a non-compressed state;

FIG. 11 illustrates a sectional view of a part of the cover in a closed locked position with the lever bars in the clamping condition with spring in a compressed state;

FIG. 12 illustrates a sectional view of a part of the cover in a closed unlocked position with the lever bars in the released condition; and

FIG. 13 illustrates a sectional view of a part of the cover in a closed locked position with the lever bars in the clamping condition.

Description of the Preferred Embodiment

Illustrated in FIG. 1 new device 10 comprises cover 12 attached to lifting handle 14. Lifting handle 14 is pivotably attached to vessel 16. Receiving members 18, 18', etc. are attached to vessel 16. Receiving members 18, 18', etc. can have a "C" or hook shape. Optional safety valve handle 20 operates valve 19. Safety valve handle 20 is shown in valve open position 23. Safety valve handle 20 is affixed to vessel 16. Safety valve handle 20 has post 21 on safety valve handle 20 to lock lever bar 24 from movement as will be better seen in FIG. 3.

Now turning to FIG. 2, device 10 is there shown with the cover 12 in position on filter housing 16. Lever locating plate 22 has lever bars 24, 24', etc. attached. Optional

safety valve handle 20 is in the open-valve position. Clamp nut 26 is located above lever bars 24, 24', etc.

Illustrated in FIG. 3 is device 10 with lever bars 24, 24', etc. engaged with receiving members 18, 18', etc. on vessel 16. Safety valve handle 20 is engaged to closed-valve position 28. Post 21 on safety valve handle 20 abuts side of lever bar 24 and constrains lever bar 24 from rotational movement.

FIGs. 4-6 show device 10 in closed unlocked position with safety valve handle 20 in open-valve position.

FIGs. 7-9 show device 10 in closed locked position with safety valve handle 20 in valve-closed position. Lever bars 24, 24', etc. are clamped by clamp nut 26.

FIG. 10 shows lever bar 24 in released condition with spring 28 beneath clamp nut 26 shown as being extended. Lever bar 24 is received in receiving member 18. Spacer 30 is disposed between receiving member 18 and ring 32 mounted to vessel 16.

Screw 34 connects lever bar 24 to lever locating plate 22 and causes lever bar 24 to move into clamped

position (FIG.11). Ring 36 is welded to dished head 12 (cover) and mates with ring 32.

FIG. 11 shows lever bar 24 in clamped condition with spring 28 beneath clamp nut 26 as being compressed. Force 40 (indicated by arrow) is thus applied to ring 36 of cover 12 with a leverage from inner end 38 of lever bar 24 (under clamp nut 26) to engagement of bar 24 with receiving member 18 at outer end 38' at lever bar 24. A force multiplication is created. Force 40 causes ring 36 of cover 12 to seal against ring 32 of vessel 16 preventing loss of fluids from vessel 16. Seal 42 is disposed in groove 44. Seal 44 can be an "O" ring, a gasket or other sealing material.

FIGs. 12 and 13 depict ring 28 holding lever bar 24 in position. Lever bar 24 thus is prevented from dropping when unclamped as shown in FIG. 12.